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National Capital Region
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Science Advisory Report 2007/011

RECOVERY POTENTIAL ASSESSMENT OF NORTHERN BOTTLENOSE WHALE, SCOTIAN SHELF POPULATION

Photo credit: Jefferson, T.A., S. Leatherwood, and M.A. Webber. 1993. FAO species identification guide. Marine mammals of the world. Rome, FAO

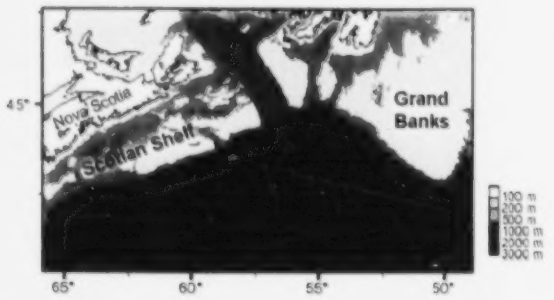

Figure 1. Location of the Scotian Shelf

Context

In April 1993 the northern bottlenose whale (Hyperoodon ampullatus) was given a single designation of Not at Risk. The Canadian portion of this species was split into two populations in April 1996 to allow a separate designation of the Scotian Shelf population and the Labrador population. The Scotian Shelf population was designated by COSEWIC as Special Concern. Its status was uplisted to Endangered in November 2002.

In 2002 COSEWIC designated the Scotian Shelf population as endangered based on its small population estimate and the potential threat posed by oil and gas development in and around the population's prime habitat. This population was legally listed under the Species at Risk Act *in 2006.*

SUMMARY

- Average population estimate for the 1988 to 2003 period is 163 individuals (95% confidence interval 119–214). There is no statistically significant trend in abundance.
- The Scotian Shelf population is highly aggregated and has been sighted most often in the deep waters of three underwater canyons, the Gully, Shortland Canyon, and Haldimand Canyon on the edge of the Scotian Shelf. The whales are thought to be year-round residents but winter distribution is not well understood.
- There is no evidence from the whaling records or sightings data to suggest that distribution has been reduced. Current distribution should be maintained.
- The Gully, Shortland Canyon, and Haldimand Canyon appear to be critical habitat.
- Total allowable harm was calculated to be 0.3 animals per year using the Potential Biological Removal (PBR) methodology.
- Potential threats include entanglement/bycatch in fishing gear, oil and gas activities and acoustic disturbance.

Canada

BACKGROUND

Rationale for Assessment

The *Species at Risk Act* (SARA) provides legal protection to species listed in Schedule 1 including the northern bottlenose whale (Scotian Shelf population). Under SARA it is prohibited to kill, harm, harass, capture or take an individual of this population and also to destroy any part of its critical habitat. Section 73 of SARA authorizes competent Ministers to permit otherwise prohibited activities affecting a listed wildlife species, any part of its critical habitat, or the residences of its individuals if certain preconditions are met.

Under section 73(2) of SARA, authorizations may only be issued if:

(a) the activity is scientific research relating to the conservation of the species and conducted by qualified persons;

(b) the activity benefits the species or is required to enhance its chance of survival in the wild; or

(c) affecting the species is incidental to the carrying out of the activity.

Section 73(3) establishes that authorizations may be issued only if the competent minister is of the opinion that:

(a) all reasonable alternatives to the activity that would reduce the impact on the species have been considered and the best solution has been adopted;

(b) all feasible measures will be taken to minimize the impact of the activity on the species or its critical habitat or the residences of its individuals; and

(c) the activity will not jeopardize the survival or recovery of the species.

Decisions made on permitting of harm and in support of recovery planning need to be informed by the impact of human activities on the species, alternatives and mitigation measures to these activities, and the potential for recovery. An evaluation framework, consisting of three phases (species status, scope for human–induced harm, and mitigation) has been established by DFO to allow determination of whether or not SARA incidental harm permits can be issued. A recovery strategy, and subsequently an action plan, is required for all wildlife species listed in Schedule 1 as threatened, endangered, or extirpated. The analysis provided herein will inform issuance of incidental harm permits and recovery planning. In the context of this status report, "harm" refers to all prohibitions as defined in SARA.

Historical Whaling

Northern bottlenose whales were exploited by three groups in Canadian waters. In the 1800s the British hunted the Labrador population. This hunt ended in 1892. The Norwegians entered the northern bottlenose whale hunt in the late 1800s, targeting whales in the north-eastern Atlantic. Between 1969 and 1971 the Norwegians took 818 whales off Labrador. They have not hunted this species since 1973. A Canadian hunt based out of Blandford, Nova Scotia took place between 1962 and 1967. During this period 87 whales were taken from the Scotian Shelf population. All georeferenced records from this hunt were from the Gully.

Species Biology and Ecology

The northern bottlenose whale is a beaked whale that ranges in size from about 7 to 9 metres at maturity. Males have a larger head, relative to body size, and a squared forehead, while females and immature males have a much more rounded forehead. The reproductive cycle of the Scotian Shelf population has not been examined in detail, but fewer calves are observed in the population than expected if mature females calved every other year, as in other areas. The whales can live up to about 40 years old.

Northern bottlenose whales are found only in the northern North Atlantic, occurring in cool and subarctic waters. They are distributed from Nova Scotia to the Davis Strait, across the North Atlantic along the east coast of Greenland, and from England to the west coast of Spitzbergen. They are distributed in the western Atlantic along the eastern Scotian Shelf and the shelf edge of the northern Grand Banks, and up to Davis Strait. The whales on the Scotian Shelf, which are considered a distinct population, are highly aggregated. They are a deep-water species. On the Scotian Shelf, northern bottlenose whales have been sighted most often in the deep waters of three underwater canyons (the Gully, Shortland Canyon, and Haldimand Canyon) along the shelf edge. They are thought to be year-round residents but winter distribution is not understood.

Compared to other deep-diving squid eaters, the northern bottlenose whales appear to have a much more specialised diet. On Scotian Shelf, diet studies suggest that the primary prey is *Gonatus steenstrupi*. In addition to *Gonatus* squid, fish, and other invertebrates are eaten though in much smaller quantities.

There is evidence that both mating and calving occur at the Gully. It is not known whether the Gully has characteristics beyond foraging that make it particularly well-suited to mating and calving.

ASSESSMENT / ANALYSIS

Current Abundance and Trends

Abundance has been estimated from photo-identification data using mark-recapture models. The average population estimate for the 1988 to 2003 period is 163 individuals (95% confidence interval 119–214). There is no statistically significant trend in abundance in the models.

Current Distribution and Trends

The species ranges across the North Atlantic Ocean. The full extent of the range of the Scotian Shelf population is unknown. This population's distribution is aggregated; the vast majority of sightings have been in or near the Gully, Shortland Canyon, and Haldimand Canyon with a few whales seen infrequently in other areas of the Scotian Shelf. Northern bottlenose whales are found, on occasion, along the edge of the southern Grand Banks off Newfoundland. It is not known to which population these whales belong.

There is no evidence from the whaling records or sightings data to suggest that distribution has been reduced.

Critical Habitat

Critical habitat for this population is characterised by waters of more than 500 metres in bottom depth in the canyons along the edge of the Scotian Shelf that provide access to sufficient accumulations of prey (*Gonatus* squid) to allow northern bottlenose whales not only to meet their individual caloric requirements but to socialise, mate, and rear their young.

Three canyons along the edge of Scotian Shelf appear to be critical habitat for northern bottlenose whales. Almost all the survey sightings have been in the Gully, Shortland Canyon, and Haldimand Canyon. There are three smaller canyons, Verrill, Dawson, Logan canyons (Figure 2), further west on the Scotian Shelf but whales have been rarely observed in these areas. Nevertheless, they may be important habitat should the population increase.

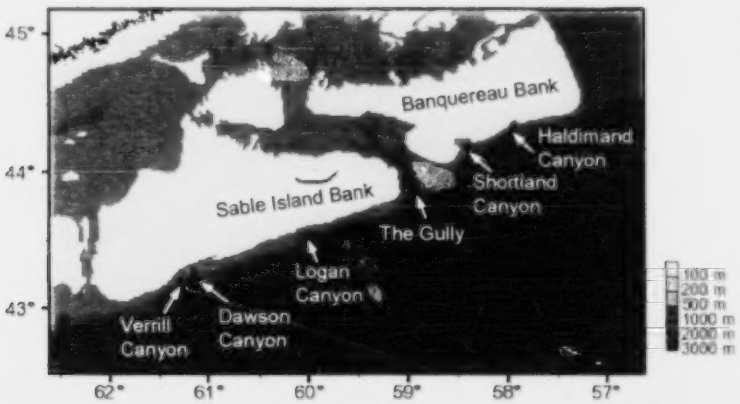

Figure 2. The Scotian Shelf with locations of major canyons.

Carrying capacity of northern bottlenose whales on the Scotian Shelf is unknown. The density of whales is higher in the Gully than in the other two canyons. This could indicate that there is room for expansion in Shortland and Haldimand canyons. However a large canyon such as the Gully can have proportionately higher productivity due to its oceanographic and bathymetric characteristics suggesting that it would be able to support higher densities of whales than smaller canyons. The lack of population growth and apparent low birth rates could mean that northern bottlenose whales are close to or at carrying capacity, although low birth rates may be unrelated to carrying capacity.

Northern bottlenose whales do not have any known dwelling-place similar to a den or nest during any part of their life cycle; hence the concept of "residence" as defined in the Species at Risk Act does not apply.

Recovery Targets

Whaling in the 1960s took 87 whales from this population, at least 25 of which were from the Gully. It is possible that the present abundance is at pre-whaling population size but this cannot be determined. In light of the paucity of information on a secure population size, a reasonable

population target is a stable or increasing population. Population increase, if it occurs, will likely be slow based on apparently low birth rates.

The distribution does not appear to have changed over the last two decades. Current distribution should be maintained as a minimum.

Allowable Harm

The Potential Biological Removal (PBR) was calculated to serve as an estimate of potential allowable levels of human-induced mortality. For the calculation of PBR for northern bottlenose whales, the following parameter values were used:

N_{MIN} = 144; the lower 20% percentile of the 95% confidence limit for the population estimate (Whitehead and Wimmer 2005)
R_{MAX} = 0.04; the default value recommended for cetaceans, and
F_R = 0.1; the recommended recovery factor for endangered whales.

PBR for the Scotian Shelf population of northern bottlenose whales was calculated to be 0.3 animals per year.

Threats to Recovery

During the past 25 years, five entanglements/catches have been documented by fishery observers on the Scotian Shelf. No assessment can be made of mortality associated with these five events. The squid fishery and the silver hake fishery along the edge of the eastern Scotian Shelf (silver hake box), from which four of the entanglements were reported, are no longer prosecuted. The third gear type known to have interacted with two northern bottlenose whales is longline, which is still used near aggregations of these whales.

Although there is a restriction on all fishing activity in the deep water areas of the Gully Marine Protected Area (MPA) (Figure 4), bottom and pelagic longline are used along the shelf edge outside of the Gully. There are several other fisheries nearby including snow crab, surf clam, quahog, and exploratory mackerel. None of the gear types used for these fisheries has been implicated in northern bottlenose entanglements. Also, they are currently executed in waters less than 500 metres deep and so are unlikely to overlap in space with the whales.

Acoustic disturbance is considered a threat to individuals of this species as well as their habitat. Potential sources of acoustic disturbance include military exercises (SONAR, detonations), marine scientific research using sound, oil and gas exploration and extraction, vessel traffic, aircraft traffic, and construction. Military SONAR has been implicated in fatal stranding events in other beaked whale species.

Northern bottlenose whales appear to have a fairly specialised diet consisting predominantly of squid of the *Gonatus* genus. Should a large-scale fishery develop for these squid, it may compromise northern bottlenose whales' ability to meet energetic requirements.

Other potential threats include increasing levels of pollutants, activities that would alter the bathymetry of or impede access to the deepwater canyons, and climate change.

Sources of Uncertainty

Current and historical range is not fully known. Survey effort is focussed on the Gully, Shortland Canyon and Haldimand Canyon in the summer months. Although there has been survey effort in other areas which have yielded occasional sightings, more effort would be needed to fully describe northern bottlenose range. Survey effort in winter months has been limited. It is not known whether the whales sighted along the southern edge of the Grand Banks are part of the Scotian Shelf population.

The abundance and distribution of *Gonatus* squid, an important component of critical habitat, are not known.

Entanglements and incidental catch of northern bottlenose whales in fishing gear are not well understood.

CONCLUSIONS AND ADVICE

The average population estimate for the 1988 to 2003 period is 163 individuals (95% confidence interval 119–214). There is no statistically significant trend in abundance but the time series is short. In light of the paucity of information on a secure population size, a reasonable population target is a stable or increasing population.

The full extent of the range of the Scotian Shelf population of the northern bottlenose whale is unknown. The majority of sightings have been in or near the Gully, Shortland Canyon, and Haldimand Canyon. These whales are seen infrequently in other areas of the Scotian Shelf. Northern bottlenose whales also occur, on occasion, along the edge of the southern Grand Banks off Newfoundland; it is not known to which population these whales belong. The distribution does not appear to have changed over the last two decades. Current distribution should be maintained.

Critical habitat for this population is characterised as waters of more than 500 metres in bottom depth in the canyons along the edge of the Scotian Shelf that provide access to sufficient accumulations of prey (*Gonatus* squid) to allow northern bottlenose whales not only to meet their individual caloric requirements but to socialise, mate, and rear their young.

Three underwater canyons on the Scotian Shelf, the Gully, Shortland Canyon, and Haldimand Canyon, appear to be critical habitat.

Northern bottlenose whales do not have residences, as defined in the SARA.

PBR for the Scotian Shelf population of northern bottlenose whales was calculated to be 0.3 animals per year.

Important potential threats include entanglement/bycatch in fishing gear, oil and gas exploitation and extraction and acoustic disturbance.

OTHER CONSIDERATIONS

In 2004 the Gully was declared a Marine Protected Area (MPA) affording it, and the organisms that inhabit it, some measure of protection (Figure 3). The MPA provides the highest level of ecosystem protection, including a restriction on all fishing activity, in the central portion of the Gully canyon (referred to as Zone 1). This zone contains a significant portion (ca. 50%) of the Scotian Shelf northern bottlenose whale population and primary habitat on the Scotian Shelf. Few activities are permitted in Zone 2 while there is potential for activities to occur in Zone 3, provided they do not contravene the regulations. Limited access to the Zones 2 and 3 has been maintained for groundfish longline and pelagic longline fisheries.

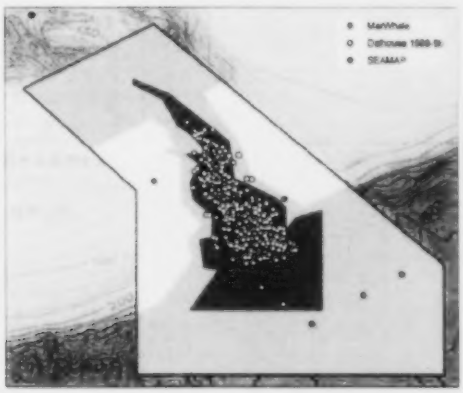

Figure 3. The Gully Marine Protected Area and northern bottlenose whale sightings in relation to the three Zones of the MPA. Zone 1 is shown in red, Zone 2 in orange and Zone 3 in yellow.

SOURCES OF INFORMATION

COSEWIC 2002. COSEWIC assessment and update status report on the northern bottlenose whale *Hyperoodon ampullatus* (Scotian shelf population) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 22 pp.

Harris, L.E., C.L. Waters, R.K. Smedbol, and D.C.Millar. 2007. Assessment of the recovery potential of the Scotian Shelf population of northern bottlenose whale, *Hyperoodon ampullatus*, DFO Can. Sci. Advis. Sec. Res Doc. In preparation

Whitehead, H. and T. Wimmer. 2005. Heterogeneity and the mark-recapture assessment of the Scotian Shelf population of northern bottlenose whale (*Hyperoodon ampullatus*). Canadian Journal of Fisheries and Aquatic Science. 62: 2573-2585.

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